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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/631,185	Applicant(s) CHAUVEL ET AL.
	Examiner Arpan P. Savla	Art Unit 2185

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 03 July 2008.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-20 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date _____
- 4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____
- 5) Notice of Informal Patent Application
 6) Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 3, 2008 has been entered.

Response to Amendment

This Office action is in response to Applicant's communication filed July 3, 2008 in response to the Office action dated April 10, 2008. Claim 1 has been amended. Claims 1-20 are pending in this application.

REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 11 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Shen et al. (U.S. Patent 5,687,336) (hereinafter "Shen") with "The PC Guide: The Memory Controller" (hereinafter "PC Guide") offered as extrinsic evidence.**

3. **As per claim 11,** Shen discloses a computer system, comprising:
a processor (col. 4, line 37; Fig. 2);
a memory coupled to the processor (col. 4, lines 33-34; Fig. 2, element 26); *It should be noted that the memory physically lies within the processor, thus making the memory and processor coupled.*
a stack that exists in memory and contains stack data (col. 4, lines 33-34; Fig. 2, element 26);
a memory controller coupled to the memory (col. 5, lines 19-23). *It should be noted that Shen does not expressly disclose a memory controller in the design, however, PC Guide states that every computer has within it a hardware logic circuit called the memory controller. Also, PC Guide states that the memory controller generates the necessary signals to control the reading and writing of information from and to the memory. Lastly, PC Guide states that the memory controller interfaces the memory with the other major parts of the computer system.*

trend logic (col. 4, lines 40-43; Fig. 2, element 20);
wherein the processor executes instructions (col. 4, lines 36-37);
wherein the trend logic provides trend information about the stack to the controller (col. 5, lines 10-14 and 19-22; Fig. 2, elements 20, 24, 40, and 94); *It should be noted that the trend information is calculated by the three-way addition of the stack*

pointer, segment base, and increment value (which comes from the increment logic) and then the trend information is sent from the three-port adder to the memory controller.

wherein the trend information about the stack is based on at least one future instruction (col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; Figs. 2 and 4).

4. **As per claim 13.** Shen discloses the trend logic determines a net stack trend based on current instruction and future instruction information coming from the decode logic (col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15; col. 4, lines 36-60; Fig. 2, elements 20, 30, and 94).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 1-4, 6-10, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shen et al. (U.S. Patent 5,687,336) (hereinafter “Shen”) in view of Flake et al. (U.S. Patent 7,065,613) (hereinafter “Flake”) with “The PC Guide: The Memory Controller” (hereinafter “PC Guide”) offered as extrinsic evidence.**

7. **As per claim 1,** Shen discloses a method of managing memory, comprising:
determining stack trend information using current and future stack operating instructions (col. 4, lines 11-15 and 36-60; Fig. 2; col. 3, line 65 – col. 4, line 7; col. 6,

line 58 – col. 7, line 15; Fig. 4); *It should be noted that Shen's final value for the stack pointer indicates whether the stack size has increased or decreased.*

Shen does not disclose reducing data traffic between various levels of a memory based on trend information.

Flake discloses reducing data traffic between various levels of a memory based on trend information (col. 6, lines 32-44). *It should be noted that the decision to skip reading the line from main memory is based on the stack operation.*

Shen and Flake are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Flake's miss algorithm to Shen's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of reducing the number of accesses to main memory.

8. **As per claim 2,** the combination of Shen/Flake discloses determining the trend information includes examining future instructions to determine if the size of the stack is going to decrease as a result of future instructions (Shen, col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; col. 5, lines 1-5 and 9-10; Figs. 2 and 4).

9. **As per claim 3,** the combination of Shen/Flake discloses a predetermined number of instructions are used in determining stack trend information (Shen, col. 3, lines 65-67; col. 6, lines 47-48). *It should be noted that if there is only one instruction*

per stage and there are five stages in the pipeline, then five instructions are used in determining stack trend information.

10. **As per claim 4,** the combination of Shen/Flake discloses the number of predetermined instructions is at least two (Shen, col. 3, lines 65-67; col. 6, lines 47-48). See citation note for claim 3 above.

11. **As per claim 6,** the combination of Shen/Flake discloses determining which word of the dirty cache line is going to be written to (Flake, col. 5, lines 55-57; Fig. 5). It should be noted that in Flake's cache each line contains 2 bytes (col. 5, line 48). Since 2 bytes = 1 word, it follows that in Flake's cache each line contains 1 word. Thus, once the algorithm chooses which dirty line to replace, as a consequence it has also determined which word of the dirty line (to be replaced) is going to written to.

12. **As per claim 8,** the combination of Shen/Flake discloses determining the trend information includes examining future instructions to determine if the size of the stack is going to increase as a result of future instructions (Shen, col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; col. 5, lines 1-7; Figs. 2 and 4).

13. **As per claim 7,** Shen discloses a method of managing memory, comprising:
determining stack trend information using current and future stack operating instructions (col. 4, lines 11-15 and 36-60; Fig. 2; col. 3, line 65 – col. 4, line 7; col. 6, line 58 – col. 7, line 15; Fig. 4); See the citation note for the same limitation in claim 1 above.

utilizing the trend information to reduce data traffic between various levels of a memory (col. 8, lines 34-47). It should be noted that the limitation "to reduce data traffic

between various levels of a memory" is merely a recitation of intended use for the "trend information." A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. It should also be noted that by having the stack pointer signal a mis-aligned access, push/pop pairing is prevented, a second cache access is prevented, thus, data traffic between various levels of the cache are reduced.

Shen does not disclose the levels of memory comprise a cache memory containing multiple cache lines and a main memory, and wherein the trend information is used to restrict writing dirty cache lines from cache memory to main memory when the trend information indicates the stack is decreasing.

Flake discloses the levels of memory comprise a cache memory containing multiple cache lines and a main memory (col. 6, lines 4-9; Fig. 6), and wherein the trend information is used to restrict writing dirty cache lines from cache memory to main memory when the trend information indicates the stack is decreasing (col. 6, lines 29-31). *It should be noted that a "deletion of a group of stack objects" is analogous to the "stack decreasing."*

Shen and Flake are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Flake's miss algorithm to Shen's stack trend tracker system

because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of reducing the number of accesses to main memory.

14. **As per claim 9,** Shen discloses a method of managing memory, comprising:
determining stack trend information using current and future stack operating instructions (col. 4, lines 11-15 and 36-60; Fig. 2; col. 3, line 65 – col. 4, line 7; col. 6, line 58 – col. 7, line 15; Fig. 4), including determining if the size of the stack is going to increase as a result of future instructions (col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; col. 5, lines 1-7; Figs. 2 and 4);
utilizing the trend information to reduce data traffic between various levels of a memory (col. 8, lines 34-47). *See the citation note for the same limitation in claim 7 above.*

Shen does not disclose determining if a line is written back including analyzing the trend information and including examining a dirty cache line to determine which word of the dirty cache line is going to be written to.

Flake discloses determining if a line is written back including analyzing the trend information (col. 6, lines 13-28) and including examining a dirty cache line to determine which word of the dirty cache line is going to be written to (col. 5, lines 55-57; Fig. 5).

See the citation note for claim 6 above.

Shen and Flake are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Flake's miss algorithm to Shen's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of reducing the number of accesses to main memory.

15. As per claim 10, the combination of Shen/Flake discloses the dirty cache line is written from a cache memory to a main memory (Flake, col. 6, lines 22-23).

16. As per claim 15, Shen discloses a computer system, comprising:
a processor (col. 4, line 37; Fig. 2);
a memory coupled to the processor (col. 4, lines 33-34; Fig. 2, element 26); *See the citation note for the same limitation in claim 11 above.*

a stack that exists in memory and contains stack data (col. 4, lines 33-34; Fig. 2, element 26);

a memory controller coupled to the memory (col. 5, lines 19-23). *It should be noted that Shen does not expressly disclose a memory controller in the design, however, PC Guide states that every computer has within it a hardware logic circuit called the memory controller. Also, PC Guide states that the memory controller generates the necessary signals to control the reading and writing of information from and to the memory. Lastly, PC Guide states that the memory controller interfaces the memory with the other major parts of the computer system.*

trend logic (col. 4, lines 40-43; Fig. 2, element 20);

wherein the processor executes instructions (col. 4, lines 36-37);
wherein the trend logic provides trend information about the stack to the controller (col. 5, lines 10-14 and 19-22; Fig. 2, elements 20, 24, 40, and 94); *See the citation note for the same limitation in claim 11 above.*

wherein the trend information about the stack is based on at least one future instruction (col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; Figs. 2 and 4).

Shen does not disclose the memory includes a cache memory containing multiple cache lines and a main memory, and wherein the trend information is used to restrict writing dirty cache lines from cache memory to main memory when the trend information indicates the stack is decreasing.

Flake discloses the memory includes a cache memory containing multiple cache lines and a main memory (col. 6, lines 4-9; Fig. 6), and wherein the trend information is used to restrict writing dirty cache lines from cache memory to main memory when the trend information indicates the stack is decreasing (col. 6, lines 29-31). *See the citation note for the similar limitation in claim 7 above.*

Shen and Flake are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Flake's miss algorithm to Shen's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in

their respective functions, and the combination would have yielded the predictable results of reducing the number of accesses to main memory.

17. **As per claim 16.** Shen discloses a computer system, comprising:
 - a processor (col. 4, line 37; Fig. 2);
 - a memory coupled to the processor (col. 4, lines 33-34; Fig. 2, element 26); *See the citation note for the same limitation in claim 11 above.*
 - a stack that exists in memory and contains stack data (col. 4, lines 33-34; Fig. 2, element 26);
a memory controller coupled to the memory (col. 5, lines 19-23). It should be noted that Shen does not expressly disclose a memory controller in the design, however, PC Guide states that every computer has within it a hardware logic circuit called the memory controller. Also, PC Guide states that the memory controller generates the necessary signals to control the reading and writing of information from and to the memory. Lastly, PC Guide states that the memory controller interfaces the memory with the other major parts of the computer system.
 - trend logic (col. 4, lines 40-43; Fig. 2, element 20);
wherein the processor executes instructions (col. 4, lines 36-37);
wherein the trend logic provides trend information about the stack to the controller (col. 5, lines 10-14 and 19-22; Fig. 2, elements 20, 24, 40, and 94); See the citation note for the same limitation in claim 11 above.
wherein the trend information about the stack is based on at least one future instruction (col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; Figs. 2 and 4).

Shen does not disclose the memory includes a cache memory and a main memory, and wherein the cache memory contains a dirty cache line, and wherein the dirty cache line is written to main memory if the trend information indicates the stack is increasing.

Flake discloses the memory includes a cache memory and a main memory (col. 6, lines 4-9; Fig. 6), and wherein the cache memory contains a dirty cache line (col. 6, lines 19-20), and wherein the dirty cache line is written to main memory if the trend information indicates the stack is increasing (col. 6, lines 13-28). *It should be noted that "stack growth" is analogous to the "stack increasing."*

Shen and Flake are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Flake's miss algorithm to Shen's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of reducing the number of accesses to main memory.

18. **As per claim 17,** Shen discloses a method, comprising:

determining whether the size of a stack is increasing or decreasing (col. 3, line 65 – col. 4, line 7; col. 4, lines 11-15 and 36-60; col. 5, lines 1-7 and 9-10; Fig. 2).

Shen does not disclose issuing a write request to a cache memory, wherein the cache memory includes multiple cache lines;

determining whether the write request refers to a predetermined word within a dirty cache line.

Flake discloses issuing a write request to a cache memory, wherein the cache memory includes multiple cache lines (col. 5, line 55; col. 6, lines 4-5; Fig. 6);

determining whether the write request refers to a predetermined word within a dirty cache line (col. 5, lines 55-57; Fig. 5). *See the citation note for claim 6 above.*

Shen and Flake are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Flake's miss algorithm to Shen's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of reducing the number of accesses to main memory.

19. **As per claim 18,** the combination of Shen/Flake discloses determining whether the write request will be to the end of a dirty cache line (Flake, col. 5, lines 55-57; Fig.

5). *See the citation note for claim 6 above.*

20. **As per claim 19,** the combination of Shen/Flake discloses the stack size is increasing and the dirty cache line is written to a main memory (Flake, col. 6, lines 13-28).

21. **As per claim 20,** the combination of Shen/Flake discloses the stack size is decreasing and the dirty cache line is retained in the cache memory (Flake, col. 6, lines 29-31).
22. **Claims 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shen in view of O'Connor et al. (U.S. Patent 6,026,485) (hereinafter "O'Connor").**
23. **As per claim 12,** Shen discloses all the limitations of claim 12 except an instruction decoder comprising a first portion that decodes current instructions and a second portion that decodes future instructions.

O'Connor discloses an instruction decoder comprising a first portion that decodes current instructions and a second portion that decodes future instructions (col. 3, lines 5-10, 15-18, and 42-48). *It should be noted that first instructions are current instructions while second instructions are future instructions.*

Shen and O'Connor are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply O'Connor's instruction decoder to Shen's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of instruction folding for a stack based machine.

24. **As per claim 14,** the combination of Shen/O'Connor discloses the second portion of the decoder is adjusted so that the number of future instructions that are decoded equals at least two (O'Connor, col. 3, lines 59-60). *It should be noted that first instructions are current instructions while second and third instructions are both future instructions.*

25. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Shen in view of Flake as applied to claim 1, and further in view of Ebrahim et al. (U.S. Patent 5,893,121) (hereinafter "Ebrahim").

26. **As per claim 5,** the combination of Shen/Flake discloses all the limitations of claim 5 except the cache memory maintains a single dirty cache line for stack data.

Ebrahim discloses the cache memory maintains a single dirty cache line for stack data (col. 5, lines 32-35). *It should be noted that a cache block maintaining a dirty bit is analogous to a "dirty cache line".*

The combination of Shen/Flake and Ebrahim are analogous art because they are from the same field of endeavor, that being computer memory systems.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply Ebrahim's stack cache memory containing a single dirty cache line to Shen/Flake's stack trend tracker system because all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded the predictable results of automatically recovering

memory objects no longer in use by the operating system and application programs in a computer system.

Response to Arguments

27. The indicated allowability of claims 7, 9, 10, 15, and 16 is withdrawn in view of the newly discovered reference to Flake et al. Rejections based on the newly cited reference are presented above.
28. Applicant's arguments filed July 3, 2008 with respect to claims 1-6, 8, 11-14 have been fully considered but they are not persuasive.
29. Applicant's arguments filed July 3, 2008 with respect to claims 17-20 have been considered but are moot in view of the new ground of rejection above.
- 30.
31. With respect to Applicant's argument in the second full paragraph on page 7 of the communication filed July 3, 2008, the Examiner respectfully disagrees. As commonly defined, a "trend" is "the general movement over time of a statistically detectable change." In Shen, a new stack pointer indicates the final value of the stack and therefore the new stack pointer reflects the general movement of the stack size over a period of time (the period of time being the time between the generation of the old stack pointer and the generation of the new stack pointer). The various stages in Shen's pipelined processor contain both current and future instructions. These instructions are used to generate a new stack pointer. As detailed above, the new stack pointer reflects the "trend" of the stack and is therefore equivalent to "trend information."

Accordingly, Shen sufficiently discloses determining stack trend information using future stack operating instructions.

32. With respect to Applicant's argument beginning in the last paragraph on page 7 through the first paragraph on page 8 of the communication filed July 3, 2008, this argument is moot in view of the new ground of rejection above.

33. As for Applicant's arguments with respect to the dependent claims, the arguments rely on the allegation that the independent claims are allowable and therefore for the same reasons the dependent claims are allowable. However, as addressed above, the independent claims are not allowable, thus, Applicant's arguments with respect to the dependent claims are not persuasive.

Conclusion

STATUS OF CLAIMS IN THE APPLICATION

The following is a summary of the treatment and status of all claims in the application as recommended by MPEP 707.70(i):

CLAIMS REJECTED IN THE APPLICATION

Per the instant office action, **claims 1-20** have received a first action on the merits and are subject of a first action final.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arpan P. Savla whose telephone number is (571) 272-1077. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah can be reached on (571) 272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Arpan Savla/
Examiner, Art Unit 2185
September 15, 2008

/Sanjiv Shah/
Supervisory Patent Examiner, Art Unit 2185